AMPC
AUSTRALIAN MEAT PROCESSOR CORPORATION

Australian Meat Processing.

Networked, Ethical, Sustainable and Intelligent

A Year 9 & 10 Educational Resource for Schools

Acknowledgements

This online curriculum-linked resource was produced by the Australian Meat Processing Corporation (AMPC).

The curriculum-linked resource is designed to introduce young people to the production and processing of red meat in Australia.

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The materials in this educational resource have been developed by Angela Colliver from Angela Colliver Consulting Services, Pty., Ltd.

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All links to websites were accessed in January 2017. As content of the websites used in this unit is updated or moved, hyperlinks may not always function.

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Introduction

The aim of this online curriculum-linked educational resource is to help teachers and students in secondary schools investigate and understand more about the Australian red meat processing industry.

The objectives of the educational resource are to:

- Support AMPC and its members in expanding awareness about the red meat processing industry in Australia by engaging and informing teachers and students about the role and importance of the industry in the Australian economy, environment and wider community.
- Engage and inform teachers and students regarding state-of-the-art processing facilities and best practice red meat production.
- Provide resources which help build leadership skills among teachers and students so they can communicate about red meat production and the industry in Australia.
- Increase knowledge and understanding about the complexity and innovative nature of Australia's red meat processing industry.
- Provide encouragement, information and practical teaching advice that supports teachers to educate their students about red meat production processes and the red meat processing industry.
- Educate school students about innovation and environmentally sustainable practices implemented in the red meat processing industry.
- Expand awareness of the broad range of career pathways available through the red meat processing industry and broader supply chain.
- Develop engaging learning programs using an inquiry process and the Project Based Learning (PBL) approach aligned with the Australian Curriculum.

These online curriculum-linked educational resources provide practical support for teachers and students learning about food and fibre production and primary industries in schools.

The Learning Process in this Unit

This educational resource is a unit of work that uses an inquiry-based and integrated approach to learning. It is also student-centred and interactive.

It makes extensive use of the student's existing knowledge, questions and investigations. It uses a teaching and learning model based on the current philosophy that scientific knowledge is a social construction, highlighting how people's ideas and explanations create new knowledge. The teaching and learning model is also based on the idea that learning is a process of personal construction and reconstruction of ideas, rather than the absorption of a hierarchy of taught facts and concepts.

In practical terms, this means that teachers are not seeking to instil in students a selection of understandings, but are teaching and supporting them to experience and use creative ways of thinking to develop understandings of issues around them.

The interactive teaching and learning approach is based on the 21st Century Fluencies created by Crockett et al. (2011), and are outlined extensively in the book ***'Literacy Is Not Enough'*** by Crockett et al. (2011). See **https://globaldigitalcitizen.org/**. It uses the *solution fluency* through six phases: **Define; Discover; Dream; Design; Deliver and Debrief**. The phases of the model are based on based on

The fluencies are:

- **Define:** The 'Define 'phase begins with lessons that intellectually engage students with a challenge, problem, question and task. This phase captures their interest, provides an opportunity for them to express what they know about the topic, share understandings being developed, and helps them to make connections between what they know and the new ideas.
- **Discover:** The 'Discover' phase includes activities in which students can explore, investigate, research, read, discuss, gather, organise and compare knowledge and data. They grapple with the challenge, problem, question or phenomenon and describe it in their own words. This phase provides a context and enables students to acquire a common set of experiences that they can use to help each other make sense of the new knowledge or understandings.
- **Dream:** The 'Dream' phase enables students to imagine and develop possible solutions and explanations for the challenge, problem, question and task they have experienced. The significant aspect of this phase is that the students' explanations follow substantive conversations and higher order thinking experiences.
- **Design:** The 'Design' phase provides opportunities for students to apply what they have learned to new situations, to map production processes and so develop a deeper understanding of the challenge, problem, question or phenomenon. It is important for students to extend explanations and understandings, using and integrating different modes such as diagrammatic images, written language and media.
- **Deliver:** The 'Deliver' phase has two stages – production and publication or presentation. In the production phase, the task comes to life – this is the doing phase. At the end of this phase, the student task should be completed. Next, they present or publish their work sample to an audience.
- **Debrief:** The 'Debrief' phase provides an opportunity for students to revisit, review and reflect on their own learning and new understanding and skills. This is also when students provide evidence for changes to their understanding, beliefs and skills.

Source: Solution Fluency **https://globaldigitalcitizen.org/**

Throughout this educational resource the emphasis is on providing teachers with ideas and activities that enable them to:

- Provide a supportive classroom environment by valuing what students already know; meeting individual and collective needs; providing scaffolding and supporting all students to be successful.
- Be a resource person by collecting resources and materials; and suggesting strategies for investigation.
- Be a fellow investigator by advising on appropriate investigations; modelling ways of learning and identifying learning opportunities.
- Challenge students' ideas and learning strategies by encouraging further inquiry, providing the stimulus for investigating real life situations and alternative viewpoints, and empowering students to investigate and respond to a challenge, task or project (commonly called 'Project-Based Learning').
- Co-evaluate what students know, can do and understand; using a range of assessment strategies including self assessment and peer assessment; negotiated assessment tasks, learning logs, observation and conferencing. (Note: The unit of work contains a 'Student Task' which is well suited for assessment, as it is the summation of the work undertaken by the students in the unit of work).

The unit of work has been designed as a sustained sequence of activities, based on the content descriptions of the Australian Curriculum identified in Year 9 and Year 10 in Design and Technologies and in Science.

Note that in each fluency phase, several activities are suggested from which teachers are encouraged to select the most appropriate for their purposes. Not all activities in each stage of the unit need to be used. Alternatively, teachers may adapt, modify, add to or complement the suggested activities with ideas to suit the needs of the students with whom teachers are working.

Also note, digital tools including YouTube videos and Apps are utilised in the unit, both for the teacher and students' use. The unit also offers options for how the unit can be implemented in high, low, and non-technical environments. Teachers' decisions will need to be based on what technology is readily available in their teaching environment. Students may have many ideas regarding the digital tools they might wish use in their work samples.

Teacher Notes

Resource description

The aim of this unit is to help teachers and students in secondary schools investigate and make judgements about the processing, production and marketing of Australian red meat.

The unit explores the systems used to process and produce red meat, and claims used by meat processors to market their products.

Students discover how a selection of Australian meat processing plants are using hi-tech robotics and automated systems within their plants, to increase yields and productivity, while reducing labour costs, and implementing health and safety systems, for both the animals and staff.

Students examine and analyse key elements of the processing systems used to produce red meat, analyse the claims associated with the processing system and explore marketing practices used by the industry.

In teams, students are encouraged to analyse and critique practices used by the industry, and are tasked with designing the next evolution of Meat Processing Plant using emerging sciences and technologies, and the Internet of Things.

Students are then tasked with designing an identification system that can be applied through a meat processing plant that shows all the on-site ethical and sustainability considerations.

Finally, students are required to write a script for a great commercial advertising their new meat processing plant, and what it processes and produces.

Year level: Years 9 & 10

Curriculum objectives

In this unit, students:

- Explore a range of Australian red meat processing and production methods;
- Examine technologies and methods used in the industry;
- Examine the challenges in red meat processing, including the quality assurance systems used by the industry to protect the livestock, the integrity of the product, the environment and the consumer;
- Develop a more future-orientated perspective of Australian meat processing;
- Explore various scenarios which may emerge from current trends and explore the implications of the scenarios;
- Identify and envision alternative futures in Australian meat processing;
- Exercise their critical thinking skills and creative imagination;
- Examine other aspects of red meat processing production and marketing, e.g. trace-ability in the meat value chain;
- Design a next evolution of Meat Processing Plant using emerging sciences and technologies, and the Internet of Things;
- Write a script for a commercial and commercial advertising their new meat processing plant, and what it processes and produces.
- Reflect and evaluate what they know about the processing, production and marketing of red meat products.

Based on Australian Curriculum, Assessment and Reporting Authority (ACARA) materials downloaded from the Australian Curriculum website in January 2017. ACARA does not endorse any changes that have been made to the Australian Curriculum.

Australian Curriculum Content Descriptions

Technologies

Design and Technologies knowledge and understanding

Year 9 & 10

Investigate and make judgments on the ethical and sustainable production and marketing of food and fibre **ACTDEK044**

Critically analyse factors, including social, ethical and sustainability considerations, that impact on designed solutions for global preferred futures and the complex design and production processes involved **ACTDEK040**

Explain how products, services and environments evolve with consideration of preferred futures and the impact of emerging technologies on design decisions **ACTDEK041**

Design and Technologies Processes and Production Skills

Apply design thinking, creativity, innovation and enterprise skills to develop, modify and communicate design ideas of increasing sophistication **ACTDEP049**

Science

Science as a Human Endeavour: Use and influence of science

People use scientific knowledge to evaluate whether they should accept claims, explanations or predictions, and advances in science can significantly affect people's lives, including generating new career opportunities **(ACSHE160)**

The values and needs of contemporary society can influence the focus of scientific research **(ACSHE228)**

Cross Curriculum Priorities: Sustainability

OI.2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

OI.3: Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.

OI.4: World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice are essential for achieving sustainability.

O1.5: World views are formed by experiences at personal, local, national and global levels, and are linked to individual and community actions for sustainability.

OI.6: The sustainability of ecological, social and economic systems is achieved through informed individual and community action that values local and global equity and fairness across generations into the future.

OI.7: Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

OI.8: Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

OI.9: Sustainable futures result from actions designed to preserve and/or restore the quality and uniqueness of environments.

General Capabilities

Literacy

This unit's learning experiences enable students to develop literacy capabilities that relate to everyday living contexts that students face throughout their lives. For example:

- Comprehending texts through listening, reading and viewing;
- Composing texts through speaking, writing and creating;
- Developing skills in reading, interpreting and analysing information; and
- Developing oral language skills as students ask questions, seek advice, present viewpoints and discuss their practical tasks.

Numeracy

This unit's learning experiences enable students to develop numeracy capabilities that relate to everyday living contexts as they make recipes. For example:

- Calculating and estimating; and
- Using a range of measurement techniques when producing designs.

ICT Capability

This unit's learning experiences enable students to develop the capacity to both manage and use information technology safely and responsibly, including the capacity to evaluate sources and their reliability, accuracy and validity of information and use digital technologies in academic, practical, collaborative and creative pursuits. For example:

- Applying social and ethical protocols and practices when using ICT;
- Investigating with ICT;
- Creating with ICT;
- Communicating with ICT;
- Managing and operating ICT; and
- Developing skills to undertake effective searches online and locate appropriate information in a timely manner.

Critical and Creative Thinking

This unit's learning experiences enable students to develop the capacity to solve problems, think critically and creatively, or generate new ideas. Students will also identify alternative explanations, see links and find new ways to apply ideas in the context of meat processing as they engage in analysing and designing a meat processing plant for the next century. For example:

- Inquiring – identifying, exploring and clarifying information;
- Generating innovative ideas and possibilities;
- Reflecting on thinking, actions and processes;
- Analysing, synthesising and evaluating information; and
- Developing creative solutions when they apply divergent thinking to resolving design challenges, for example, designing and creating commercial advertising their new meat processing plant, and what it processes and produces.

Personal and Social Capability

This unit's learning experiences enable students to develop the capacity to take responsibility for their own work and learning, manage their learning, monitor, reflect on and evaluate learning. They also identify personal characteristics that contribute to or limit effectiveness, plan and undertake work independently, take responsibility for their behaviour and performance, and learn from successes and failures.

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA), downloaded from the Australian Curriculum website in January 2017.

Additional Teacher Notes

Selecting activities

At each stage of the learning sequence, several activities are suggested from which teachers are encouraged to select the most appropriate for their purposes. Not all activities in each stage of the unit need to be used. Alternatively, teachers may add to or complement the suggested activities with ideas of their own.

Adapting the unit

The unit is targeted at junior secondary students. This is a suggested age range only and teachers are encouraged to modify activities to suit the needs of the students with whom they are working.

At each stage of the unit, a number of activities are listed. Teachers are not expected to do them all. Instead, the units are designed such that a selection of activities can be made at each stage. Teachers should select the activities according to the needs and interests of their students and the time, relevance to the existing school curriculum and resources available to them.

Suggestions from review teachers

Teachers who trialled and reviewed these materials encouraged others to 'put your own spin on it and be sure it is suited to your class'. Here are some of their ideas about how they did this:

- Start by finding out what students' attitudes and knowledge is of the supply chain.
- Condense the unit to suit your needs
- Take time to really explore the resources for yourselves, keeping in mind the perspective of your students and their learning needs and style. Immerse yourself in the programs first to appreciate the material that is contained in them.
- Watch all the videos first if you have no background in livestock production or no knowledge of red meat processing. Download the videos if you are in a poor download speed area (also saves school funds if downloaded once!!)
- A visit to a processing plant or a butcher would be an advantage- gives the students a better understanding of all the processes involved. Or have a guest speaker. Maybe show one of the Dr Temple Grandin videos (watch first to select the suitable parts for your own class)
- Be open-minded and you'll be surprised. Try them. Give it a go, Jump in.

Time allocation

This will, of course, depend on particular circumstances but generally, four to six weeks is suggested.

Moodles, Wikis and e-Learning Systems

It is suggested that the 'Student Resources' at the rear of this unit be made available to students on the school's e-learning system or other e-platforms such that students can access the materials and drive their own learning.

Differing tastes and eating preferences

Encouraging children to eat healthy food is a global issue. People can have different views about eating red meat and it is suggested that where students are vegetarian, pescatarian or vegan, they can choose to investigate how different fruits and vegetables are processed and marketed. These students can design the next evolution of such a processing plant and a commercial, advertising their new processing plant, and what it processes and produces.

Assessment

The assessment methodology is based on using two rubrics, one specifically for the task set in this unit, and the other based on the learning process. The **assessment rubrics** provided in this resource, are the summation of the student's learning tasks. The rubrics provide:

- A common language for discussing student achievement in relation to the tasks undertaken, and
- A means of engaging with, and communicating student achievement, to the student and his/her parents or caregivers.

The rubric columns: levels

Each of the rubrics is divided into four levels.

Level 1: Basic

Level 2: Sound

Level 3: High

Level 4: Outstanding

The rubric rows: aspects of the task

Each of the rubrics is divided into rows, with each row representing critical aspects of the student task.

The task in this learning sequence involves students:

Learning about and analysing how red meat processing companies are using ethical and sustainable production techniques, technologies and processes, and how they are marketing the products. The students, in teams, are required to design the next evolution of Meat Processing Plant using emerging sciences, technologies, and the Internet of Things, with an identification system that shows all the on-site sustainability and ethical considerations. The students are also tasked with writing a script for a commercial to advertise the plant and what it processes and produces.

Students are tasked with investigating what influences the design of processing systems. Students learn from people working in design and engineering occupations, about the services they deliver and the processing systems they have designed and installed in meat processing plants.

Students learn from people working in meat processing plants, about their processing techniques, technologies and processes, and how there are a range of considerations that influence the design of their plants.

Students are tasked in teams, with completing an analysis of the processing techniques, technologies and processes, with a specific emphasis on how these processors use systems and technologies to:

- treat the livestock ethically,
- reduce manual handling and repetitive work,
- reduce the risk of injuries,
- manage water, energy and waste productively,
- maintain equipment,
- collect data for the processor,
- make money or save money, and
- help meat processors market a quality product credibly.

The student teams are then tasked with designing an identification system that can be applied through a meat processing plant that shows all the on-site sustainability and ethical considerations involved. In addition to an identification system, students are required to write a script for a commercial to advertise the plant and what it processes and produces.

In addition, each student pair is required to make a five minute presentation of the plant design and commercial to an audience in which they explain how red meat could be processed and marketed in the future.

Overall project rubric

This rubric is designed to specifically evaluate what has been asked of the students from the scenario presented to the class.

Syllabus	Level 4	Level 3	Level 2	Level 1
ACTDEK044 ACTDEK040 Weighting 25%	A design of the next evolution of meat processing plant with an identification system that shows 10 or more on-site sustainability and ethical considerations has been created. It is informed by an analysis of a selection of processing plants and people working in design and engineering occupations who design meat processing systems for Australian meat processing plants. It also shows evidence of extensive research of the subject matter.	A design of the next evolution of meat processing plant with an identification system that shows 6-9 on-site sustainability and ethical considerations has been created. It is informed by an analysis of a selection of processing plants and people working in design and engineering occupations who design meat processing systems for Australian meat processing plants. It also shows solid evidence of research of the subject matter.	A design of the next evolution of meat processing plant with an identification system that shows 4-5 on-site sustainability and ethical considerations has been created. It is informed by an analysis of a selection of processing plants and people working in design and engineering occupations who design meat processing systems for Australian meat processing plants. It also shows evidence of some research on the subject matter.	A design of the next evolution of meat processing plant with an identification system that shows 2 on-site sustainability and ethical considerations has been created. It is informed by an analysis of a selection of processing plants and people working in design and engineering occupations who design meat processing systems for Australian meat processing plants. It shows evidence of little research of the subject matter.
ACTDEK044 Weighting 25%	The content of the script showed clear evidence of research and understanding of systems and technologies used to treat the livestock and people ethically, manage water, energy and waste productively, and market a quality product credibly.	The content of the script showed some evidence of research and understanding of systems and technologies used to treat the livestock and people ethically, manage water, energy and waste productively, and market a quality product credibly.	The content of the script showed limited evidence of research and understanding of systems and technologies used to treat the livestock and people ethically, manage water, energy and waste productively, and market a quality product credibly.	The content of the script showed little research and understanding of systems and technologies used to treat the livestock and people ethically, manage water, energy and waste productively, and market a quality product credibly.
ACTDEK041 Literacy 10% Critical & creative thinking Weighting 10%	The design and layout of the processing plant design and script makes it very easy to understand and interpret the information provided.	The design and layout of the processing plant design and script makes it easy to understand and interpret the information provided.	The design and layout of the processing plant design and script makes it possible to understand and interpret the information provided.	The design and layout of the processing plant design and script makes it difficult to understand and interpret the information provided.
ACTDEK041 Critical & creative thinking Weighting 10% ICTs Weighting 10%	The presentation of the processing plant and script to an audience which advertises the plant and what it processes and produces was communicated with a logical flow and without pauses.	The presentation of the processing plant and script to an audience which advertises the plant and what it processes and produces was communicated with a logical flow and with few pauses.	The presentation of the processing plant and script to an audience which advertises the plant and what it processes and produces was communicated with a mostly logical flow and with some pauses.	The presentation of the processing plant and script to an audience which advertises the plant and what it processes and produces was communicated with a little logic and many pauses.
Literacy Weighting 10%	The student answered all questions clearly and accurately.	The student answered most questions clearly and accurately.	The student answered some questions clearly and accurately.	The student answered a few questions clearly and accurately.

Learning process rubric

Each of the learning progressions in the learning sequence has a prerequisite for progression – a list of what the student needs to accomplish in order to proceed to the next step in the process. The text from those areas is duplicated in this rubric and can be used with students to guide their progress with feedback, in a mini-debrief, helping them to refine their process and product at critical points throughout the learning sequence.

Level 4	Level 3	Level 2	Level 1
A clear definition of the task was provided.	A somewhat clear definition of the task was provided.	An average definition of the task was provided.	A definition of the task could not be provided.
Research and analysis was completed without prompting.	Research and analysis was completed with minimal prompting.	Research and analysis was completed with some prompting.	Research and analysis was completed with significant prompting.
Needs and opportunities for the meat processing industry were identified with no prompting.	Needs and opportunities for the meat processing industry were identified with minimal prompting.	Needs and opportunities for the meat processing industry were identified with some prompting.	Needs and opportunities for the meat processing industry were identified with significant prompting.
A clear visualisation of the design was provided.	A mostly clear visualisation of the design was provided.	A reasonably clear visualisation of the design was provided.	No clear visualisation of the design was provided.
An extremely clear plan of what the design will contain was provided.	A very clear plan of what the design will contain was provided.	A clear plan of what the design will contain was provided.	A somewhat unclear plan of what the design will contain was provided.
An extremely clear plan of the accompanying identification system was provided.	A very clear plan of the accompanying identification system was provided.	A mostly clear plan of the accompanying identification system was provided.	A somewhat unclear plan of the accompanying identification system was provided.
The design has been created and presented to an audience with a logical presentation about how red meat could be processed and marketed in the future.	The design has been created and presented to an audience with a mostly logical presentation about how red meat could be processed and marketed in the future.	The design has been created and presented to an audience with a somewhat logical presentation about how red meat could be processed and marketed in the future.	The design has been created and presented to an audience with little logic about how red meat could be processed and marketed in the future.

Meat Matters:

Facts and Figures about the Australian Red Meat Processing Industry

The following basic information may be helpful when teachers interact with their school students.

The Meat and Livestock Industry

- There are approximately 29 million head of cattle, 70 million sheep and millions of bush goats in Australia.
- Australia is one of the world's most efficient producers of cattle and the world's third largest exporter of beef.
- Australia is also one of the world's leading producers of lamb and mutton, the world's largest exporter of mutton and the second largest exporter of lamb.
- Australia is a relatively small producer of goat meat yet, is the world's largest exporter of goat meat.

Source: Meat and Livestock Australia **http://mla.com.au**

Looking after our cattle, sheep and goats

Good animal welfare is not only vital from a moral and ethical perspective, but also for farmers and processors' productivity, profitability and sustainability. To continually improve the well-being of Australia's cattle, sheep and goats, the industry invests in research and development to provide tools and knowledge for farmers, transporters and processors.

Animal welfare research is undertaken on farms, at feedlots and at the processing sites of beef, lamb and goat meat.

The Red Meat Industry

Approximately 200,000 people are employed in the Australian red meat industry, including on-farm production, transporters, processing and retail activities.

Australian cattle, sheep and goat farmers, livestock transporters and processors value highly the health and wellbeing of their stock.

Farmers have an attachment to their cattle, sheep and goats, as they have often raised animals from birth and they know that healthy and well cared for stock also produce better quality, beef, lamb, mutton and goat meat. It is widely acknowledged that consumers want their red meat produced humanely and ethically. As such, Australian cattle, sheep and goat producers are recognised around the world for their animal husbandry and farm management techniques.

The Australian Meat Processing Sector

Australian Meat Processors and Butchers are passionate about delivering top quality, safe and nutritious products to the market.

The Australian Meat Processing Sector is a world leader in processing beef, lamb and goat meat and processing plants employ the latest technologies to ensure superior levels of meat product.

Australia has approximately 300 abattoirs (including boning rooms) with a workforce of around 34,000 people. The red meat processing industry is estimated to contribute just under $23 billion of value adding to the Australian economy. It includes flow-on impacts equivalent to 1.5 percent of Australia's Gross industry through value adding and by generating 134,000 jobs equivalent to 1.4 percent of full-time equivalent (FTE) employment when flow-on effects are taken into account.

Source: Heilbron, S.G. 2016. Evaluating the Socio-economic benefit of the red meat processing industry in regional Australia, pages 14 and 20. (Unpublished)

Red Meat Processors trim and prepare the beef, sheep and goat carcases to specific standards. They grade

the carcasses for colour, tenderness, fat, age, sex and bruising according to AUS-MEAT standards and weigh and brand each carcase. The weight is used to calculate how much farmers are paid.

Meat Processors who work in abattoirs include Trimmers, Boners, Graders and Packers. A 'Trimmer' skins, cleans, trims, dresses, hangs and prepares the beef, lamb or goat carcasses to specific standards. Each carcass is cut in half and carefully chilled in the chiller room. The chiller room keeps the meat at the correct temperature to ensure the red meat is tender and fresh.

After chilling, meat 'Graders', grade the beef, lamb and goat meat for colour, tenderness, fat, age, sex and any bruising on the meat. Each carcass is tagged by the 'Graders' to show the classification, the date of processing and the brand of meat, as well as the plant in which it was processed.

After chilling for at least 24 hours, the 'Boners' cut the beef, lamb and goat meat into different cuts of meat or prepare the carcasses to be sent to a butcher who will prepare the smaller cuts of meat. Meat 'Packers' pack the varying cuts of beef, lamb and goat meat ready for sale and delivery to local, regional, interstate and overseas customers.

Red meat products are transported from the processing plant to butchers, wholesalers, restaurants and supermarkets, in refrigerated trucks. There are Australian Standards that must be followed during transportation to make sure that the red meat is kept hygienic for people to eat.

Red meat for export markets is packed into large refrigerated containers and delivered to ports and airports for transport overseas. Stringent food safety standards are applied by Quality Assurance teams to ensure the meat is hygienic to eat by consumers in Australia and overseas.

Meat Processing and the Environment

The Australian meat processing industry is serious about environmental stewardship. The industry believes it has a duty to ensure that Australian red meat is produced, processed and distributed responsibly, while also remaining competitive and sustainable. The Australian meat processing industry has taken proactive steps to help ensure it carefully manages the nation's precious environment and resources. In efforts to reduce the industry's environmental footprint, ongoing industry research and development is focused on the continuous improvement of overall productivity, waste minimisation, pollution prevention, the effects of climate change, and beneficial reuse of wastes.

Projects underway include:

1. **A quantitative risk analysis of the impact of climate variability on the Australian red meat processing industry**
   This project aims to assess the risks and opportunities associated with climate variability for the red meat processing industry. It will identify the risks and opportunities, place them in a geographic context and assess their severity through frequency and intensity analysis. A backward scenario analysis will be undertaken to look at how climate extremes have impacted on the meat and livestock industry and how lessons from these events can inform climate change adaptation. The overall sustainability of the supply chain will thereby be gauged, and risk mitigation and adaptation strategies identified. Finally, the project will develop an information extension program to communicate the outcomes of the study.

2. **Investigating water and wastewater re-use and recycling opportunities while maintaining food safety at abattoirs**
   This project will take a broad, strategic look at the opportunities and constraints for improved water efficiencies at abattoirs using diverse water recovery options. It will provide a tool that will enable processors to evaluate raw water quality and end-use applications (river discharge, sewer discharge, irrigation or internal reuse as potable or non-potable water) applications of specific water treatment options and undertake cost-benefit analysis. When considering the benefits of water recycling, the quality of wastewater from existing treatment systems has a significant impact on additional treatment required to enable recycling. This influences the cost of further treatment and therefore the value proposition of water recycling. The proposed work builds on previous earlier research and investment by AMPC. Recent advances in technologies and operating strategies for water recycling have initiated the uptake of safe, economic solutions across many food and beverage industries. The meat processing industry, with its large water footprint, can potentially gain substantial economic and operational benefits, while not compromising food safety from such an approach.

Energy, waste and water

Meeting strict food safety requirements to ensure market access is maintained means that energy and water are significant inputs into the processing sector. Energy for refrigeration and sterilisation of equipment is especially important, while water is used to hydrate and wash incoming stock, and to clean livestock carcasses, processing equipment and work areas. Compared to other agricultural sectors, the red meat industry is a significant consumer of water.

From farm to plate, it is estimated that grain-fed beef production takes approximately 100,000 litres of water for every kilogram of food produced. Raising chickens takes 3,500 litres of water to make a kilogram of meat. In comparison, soybean production uses 2,000 litres per kilogram of food produced; rice, 1,912; wheat, 900; and potatoes, 500 litres. Competition for what is an increasingly valuable and scare resource may either limit the availability of water for production or processing purposes, increase water access costs or lead to an increasing level of consumer and public concern over the amount of water used. While certain sections of the value chain are embracing water savings and water re-use strategies, estimates suggest only approximately 2 per cent of total water usage is reclaimed.

Animal waste is another serious concern. According to a CSIRO study, because only a third of the nutrients fed to animals are absorbed, animal waste is a leading factor in the pollution of land and water resources. Total phosphorous excretions are estimated to be seven to nine times greater than that of humans, with detrimental effects on the environment. As a result, effluent must be discharged safely and processors face heavy fines for non-compliance with environmental laws. While regulatory measures around resource use impose significant compliance costs on the processing industry, they also underpin Australia's reputation for a high standard of food safety and product integrity in its exports.

Greenhouse gas emissions

Environmental issues pose both a challenge and opportunity for the Australian meat processing industry. The industry has tackled this challenge head-on and is making important progress in addressing these issues—especially in acknowledging and addressing water, energy and waste management and greenhouse gas (GHG) emissions.

Most of the industry's GHG relate to emissions from effluent ponds. This provides meat processors with opportunities for emissions capture, destruction or use. Industry research is developing new and innovative technologies and management systems to mitigate and utilise GHG emissions.

As well as GHG emissions, the industry is also addressing many other environmental issues proactively such as nutrient management, by-product reuse, alternative waste management and soil health.

The finding of an eight-year CSIRO investigation into the effects of the beef and dairy industries on Australia's methane emissions has suggested that outputs from cattle in Australia are 24% lower than previously thought, amounting to a revised total of approximately 2.6 million tonnes of carbon dioxide a year.

While this falls well behind energy and fuel sector outputs, agriculture remains the second largest greenhouse gas producer in the country.

A changing climate

Australia's red meat processing sector has long functioned within the continent's unique climate, geography, and incidence of extreme weather events. While such events impose significant costs, the industry has demonstrated resilience and a capacity to adapt. However the frequency and severity of extreme weather events and the underlying climate are changing.

The impact and implications of these changes will vary along the red meat industry's supply chain depending on location, timeframe, resilience and vulnerability. In some cases, climatic changes may bring opportunities. In other cases, such changes may bring risks beyond those experienced in the past, such as changes to feed distributions, increased disease and migration, impacts to transport of live animals, water scarcity and variations to energy costs.

The AMPC is working hard to raise awareness of Australia's changing climate in our sector, investing in research that seeks to understand critical vulnerabilities in the value chain and investigating technology, infrastructure options and mitigation techniques to minimise the industry's impact on the environment.

Source: AMPC (2016)

Animal Welfare

Australian meat processors have the same concerns as the community when it comes to taking care of the livestock that arrive at their plants.

Processors understand more than anyone that providing excellent care results in a contented animal that provides a high quality product… processors' livelihoods depend on it.

Staff at plants are trained in animal welfare, husbandry and handling, so that the safety and comfort of the livestock is maintained. The industry invests millions of dollars each year to research new technologies and practices to improve animal welfare, and provide valuable education and training to industry personnel throughout Australia. Additionally, AMPC invests substantially in research to improve animal welfare alone.

The Model Code of Practice for the Welfare of Livestock third edition (the Model Code) is a guide that has been developed by the Australian government in consultation with all levels of industry, regulators, RSCPA and scientists, to detail the acceptable practice for the management of Livestock. It outlines all responsibilities involved in caring for livestock—including their housing, food, water and special needs.

Source: Australian Government. Department of Agriculture and Water Resources (2016) **https://www.agric.wa.gov.au/animalwelfare/animal-welfare-codes-practice**

Food Safety

Product integrity continues to be one of the most important aspects of Australian meat production and processing. The industry has quickly responded to growing consumer demand for top quality produce that is safe to eat. The National Livestock Identification System (NLIS) is a quality assurance program that allows producers and processors to demonstrate good practice using the principles of Hazard Analysis and managing Critical Control Points for management, food safety, animal welfare, bio-security and traceability.

Australia's meat processing industry is also leading the world in ensuring its meat products are fully traceable from paddock to plate.

These systems help to ensure the integrity of the Australian meat supply chain which makes the Australian meat industry leaders in their field.

Source: MLA **http://www.mla.com.au/meat-safety-and-traceability/red-meat-integrity-system/about-the-national-livestock-identification-system/**

Step 1: The essential question and scenario

Objective: Define the main question and share the scenario that is the focus of the unit.

Ask students to brainstorm ideas about what they know about how beef, lamb or goat meat might be processed in Australian meat processing plants. Display these for future reference.

Talk with students about how Australia has approximately 300 meat processing plants, some of which are small local plants and others which are much larger processors supplying beef, lamb and goat meats for both national and international markets.

Ask students to develop a concept map describing what they know about red meat production, what it is, what it comprises, who produces and processes red meat, like beef, lamb and goat meat and why.

After sharing students' ideas, talk about all aspects of red meat production including production; processing; distribution; retailing; marketing; and consumption.

Form groups and ask students to select one particular type of red meat that is produced in Australia, and brainstorm what is involved in producing it, processing it, packaging it, distributing it, marketing it, retailing it and enabling overseas and local consumers' access to it.

Set the task and explain to the class that in this unit, their task is to learn about and analyse how red meat is processed and marketed.

Explain to the class that they will be using a range of activities, videos, images, information and websites containing information about red meat processing systems in Australia. **http://www.ampc.com.au/education-training/school-resources/meat-matters**

Their task is to work as a team and record and collect information about the systems and technologies used to process and bring red meat products to consumers.

Inform the students that after investigating the current practices used by the industry, they will also be encouraged to envision alternatives. They will need to explain, how red meat processing systems and products can evolve with consideration of preferred futures and the emergence of new ideas and technologies that could be used in red meat processing, production and even marketing.

They are encouraged to re-imagine processing methods that feature ideas for the future and emerging technologies, and produce drawings to explore their design ideas. In addition, each team will be asked to communicate their ideas to an audience later in the unit.

The teams are tasked with designing an identification system that can be applied through a meat processing plant that shows all the on-site processing system features. In particular, students are tasked with showing all the on-site sustainability and ethical features within the processing practices.

In addition, students are required to write a script for a great commercial, advertising their new meat processing plant, and what it processes and produces.

Finally, each team is also required to give a five minute presentation of their design to an audience in which they explain how red meat could be processed and marketed in the future.

Share the following question and scenario with the class. See **Resource 1.1**.

The essential question:

What benefits accrue to the consumer and processor when we have an understanding of the processing technologies and systems used by Australian red meat processors to bring us quality cuts of meat? How does an understanding of the challenges and opportunities that exist, including sustainability considerations, consumer expectations, marketing techniques and media coverage, affect our decision-making about what red meat products we buy?

Step 1: The scenario

The Australian Meat Processor Corporation (AMPC) is encouraging schools to discover how Australian meat processors might produce an array of different beef, lamb and goat meat cuts for local, national and international markets, while using highly skilled people, in addition to innovative automated technology systems and robotics.

When consumers buy beef, lamb or goat meat at the butcher or supermarket, all the hard work and innovation that goes into producing the cuts of meat we love to eat is not immediately obvious.

Discover ways red meat processing companies are using, ethical and sustainable production techniques, technologies and systems, and how they are marketing their products.

Explore how ethics, social values, profitability and sustainability considerations impact or influence the design and workings of some processing plants, and the processes and technologies used.

Examine the wide diversity and commonalities of red meat processing plants and their operating systems.

What makes red meat processing plants and their systems interesting to study is their wide diversity and commonalities throughout the world. Some are dominated by processing meat products for export, while others are devoted to processing meat products for domestic consumption. Some processing plants are highly mechanised, others aren't. Some use robotics, others don't. Some are using automated meat processing systems that reduce manual handling and provide a consistent flow of product, while others are using x-ray technology to measure carcass dimensions to optimise cutting accuracy.

Many processing plants have invested in water and energy recovery processes to increase plant sustainability. Many plants have also reformulated their waste into saleable products. Many have also installed automated systems and robots to enhance labour efficiency, eliminate many physically demanding tasks, and reduce the risk of serious injury to workers.

Could future processing plants use drones to move their product? Could processing plants use drones to take photographs or video parts of the processing sequence and gather data to inform the processing of red meats?

Could 3D stereo cameras, optical floor sensors, nano-technologies and the 'Internet of Things' be part of meat processing systems in the next century?

Become a Project Designer and use a range of activities, videos, images, information and websites containing information about red meat processing systems in Australia to design the next evolution of meat processing plant.

As part of a Design Team, record and collect information about the systems and technologies used to process and bring red meat products to consumers.

Investigate the current practices used by the industry, envision alternatives and explain how red meat processing systems and products can evolve with consideration for preferred futures and the emergence of new ideas and technologies that could be used in red meat processing, production and event marketing.

Re-imagine processing methods that feature ideas for the future and emerging technologies, and produce drawings to explain your design ideas. Your team is also asked to communicate your ideas to an audience later in the unit.

The team is tasked then with designing an identification system that can be applied through a meat processing plant that shows all the on-site processing system features. In particular, you are tasked with showing all the on-site sustainability and ethical considerations within the processing practices.

In addition, you are required to write a script for a great commercial to advertise your new meat processing plant, what it processes and produces.

Finally, each team is required to give a five minute presentation of the design and commercial to an audience, in which you explain how red meat could be processed and marketed in the future.

What investigations can assist you to research how Australian meat processors use the latest processing technologies and systems? What investigations can assist you to research how they use robotics? Will you investigate how Australian meat processors currently automated systems in the form of robotic sensing and cutting? Will you investigate how Australian meat processors use x-ray systems that create 3D maps of the bones within lamb carcasses which then provide data to robots and help them cut carcasses with accuracy far greater than human capabilities? Will you investigate whether any Australian meat processors currently use robotics and x-rays systems?

AMPC and other meat processors can help out with lots of information, images and videos on their websites.
http://www.ampc.com.au/education-training/school-resources/aust-meat-processing

Your challenge is to use the websites and a range of activities and videos to help understand how Australian meat processors produce an array of different beef, lamb and goat meat cuts for local, national and international markets, while using highly skilled people in addition to innovative automated technology systems and robotics. How will you design the next evolution of Meat Processing Plant in this project? How will your systems work? How might you present your design to others?

Put your design mojo to work and design the next evolution of Meat Processing Plant using emerging sciences and technologies, and the Internet of Things. AMPC invites you, through collaboration and clever thinking, to provide the best solutions for their industry.

Step 2: Define understandings

Objective: Have students illustrate their understanding of the challenges set out in the scenario by providing an oral definition of the task.

Capture student interest and find out what they know about the way beef, lamb and goat meat is produced, processed, labelled and marketed.

Find out what they know about what every cow, sheep and goat needs in order to be processed for meat products. For example, all need to be of the appropriate age; they need food, water, air, the ability to roam, have social interaction, be free of pests and diseases, and be protected from predators, etc.

Australia has nearly 29 million head of cattle. Brainstorm and list the different types of breeds that are processed in Australia.

Talk about the main breeds that are divided into two main varieties – temperate breeds and tropical breeds. Temperate breeds of cattle are generally European derived – breeds such as Hereford and Angus. Cattle of this variety are most predominant in the southern parts of the country, where the climate is milder and the land is rich, fertile and abundant in pasture. Tropical breeds, such as Brahman and Droughtmaster are ideal for Australia's northern areas, which are tropical with monsoon rains in the summer.

Talk about how the Australian beef industry consists of grass fed beef, grain fed beef, organic beef and breed specific products such as Wagyu and Angus.

Explore how Australia has the world's second largest sheep flock (after China), and how it produces around 7 percent of the global lamb and mutton supply and is the second largest sheep meat exporter (after New Zealand).

Explain that Australia has nearly 70 million sheep that are divided into two main categories: wool and meat.

Talk about how the main meat breeds are Border Leicester, Suffolk, Dorset, Texel and Dorper which are quite often crossed with Merinos. Sheep of these breeds are most prevalent in the Southern parts of Australia. Explain that most Australian lambs are raised exclusively on pasture.

Find out more about the production practices used by the Australian beef and sheep industry to produce beef and lamb. See **http://www.target100.com.au**

Talk with students about Australian meat processors who supply red meat products for domestic consumption and export.

Investigate red meat processors in the local region and ascertain whether they supply red meat products for domestic consumption and/or for export. See **Resource 1.1.2**.

List processors in your region, view and read their websites and social media pages. Explore how they process, market and promote their product.

Talk about how Australian industries spend millions of dollars each year promoting their products. Often campaigns and programs are conducted in the belief that raising awareness of products, providing information about them and educating people to make informed decisions about their preferred choices will lead to increasing the demand for that product.

Re-visit local processors' websites and ask students to discuss the language, brand or label used to promote the consumption of a red meat product processed by a processor in the local area. Talk about the wording, tactics and techniques used by the processor or creative agency that may have been involved in creating the website or brand.

Ask students to identify and record what facts they 'read' from the website, brand or label and what 'wider messages' they might have conveyed.

Talk with students about meat processing in more detail. Using the notes on pages 14-17 discuss the many aspects involved, including hanging, trimming, grading, chilling, boning, and packing processes – reducing any bio-security risks – handling livestock ethically- managing resources sustainably– maintaining clean and healthy flooring and equipment surfaces – maintaining quality assurance standards throughout carcass processing – using automated meat processing systems to enhance labour efficiency and eliminate many physically demanding tasks from the production line – using robotic sensing and cutting to enable highly accurate cutting – using x-ray systems and scanners to create 3D maps of bones in the carcass and then

guide cutting robots that cut with an amazing cutting accuracy – utilising robots to vacuum any bone dust from bandsaws – using automated packaging and labelling systems – driverless forklifts that can lift and carry pallets of boxed red meat products and managing the business.

Form Project Teams and ask students brainstorm what could be installed and integrated into a next evolution of meat processing plant to assure customers that meat is produced and marketed ethically and sustainably. Share the groups' ideas.

Talk with students about responsible digital citizenship in online environments. Work with students to have them understand that during this unit they will be using a range of websites, gathering a range of opinions, so students need to continuously check that the research is correct by using reliable sites. Similarly discuss the use of free and open sources for images, and videos and the need to request the use of software and media others produce.

Remind students that there are high-tech; low-tech and no-tech options that they can consider when designing and creating their next evolution of meat processing plant.

Invite students to recall the focus of the task that AMPC has invited them to undertake. See **Resource 1.1** and invite students to define the task they have been asked to address using **Resource 1.2**.

Ask students what they might need to know more about, in order to undertake the task set by AMPC. Might they need to know something about the different processing systems used by red meat processors? Might they need to know more about any advantages and disadvantages associated with aspects of the processing system? Might they need to research and evaluate the reasons why scientists, engineers and processors make claims about these advantages and disadvantages? Might they need to know something about the language and tactics used to market red meat products? Might they need to know where to find information about the meat processing systems, product labelling and whether claims are misleading or accurate? What might they have to do to design a next evolution of meat processing plant? What tools, equipment and procedures might be needed? How might they evaluate their design and the information it communicates?

Prerequisite for progression:

Ask students to articulate their understanding of the task/challenge through oral conversation and if appropriate, a written (scribed) statement using **Resource 1.2**.

Note: The Prerequisite for Progression are the checkpoints that occur at the end of each stage of the learning sequence. This is the time when formative feedback is given to the students about what they have accomplished in that stage. It describes what the students must complete before they move onto the next phase of the unit. (Crockett, et, al)

Step 3: Discover

Objective: Have students research, read, view, listen to, discuss, gather, organise ideas about how Australian meat processors produce an array of different beef, lamb and goat meat cuts for local, national and international markets, while using highly skilled people in addition to innovative automated technology systems and robotics.

Ask students to consider the questions 'What do all Australian meat processors need to be productive?'; 'What might the main processing systems used by Australian meat processors include?'; 'What might the advantages and disadvantages of such processing system be in relation to ethical and sustainable practices?';' How might production claims for red meat products be communicated with consumers?'; and 'How might the ways red meat products are labelled and marketed become more informative?'

Capture students' interest and view a sample of website materials, videos, print materials and social media tools that cover various meat processing systems, marketing and labelling topics. Share **Resource 1.3** for students' use during the 'Discover' phase.

Examples include:

- Thomas Foods International **http://thomasfoods.com/**
- Gundagai Meat Processors **http://www.gmpgundagai.com.au/**
- Fletchers International Exports **http://www.fletchint.com.au/**
- JBS Australia **http://www.jbssa.com.au/**
- Teys Australia at **http://www.teysaust.com.au/**

Gundagai Meat Processors

View a video and discover the more about the automated systems and robotics that are installed at Gundagai Meat Processors in New South Wales. Hear about the 'Brisket saw' that delivers highly accurate cutting of the lamb carcasses, with a consistent flow of product. Discover more about the 'Sani – Vac' that replaces manually using steam and heavy equipment to vacuum and sanitise each carcass by removing bone dust or contaminants on the carcass itself. Look for other automated systems that move the lamb meat, cut them, package and x-ray them before being boxed and labelled for distribution throughout southern Australia. **https://youtu.be/bZKSsHXO6rc**

Listen to a podcast and hear from Mr. Will Barton, the CEO of Gundagai Meat Processors (GMP) and the systems and technologies used at the plant to ensure sustainable and ethical processing and production of lamb. Find out what Will says about how Gundagai Meat Processors use sustainable resource management practices here to process lamb. **https://youtu.be/s-WECeqkI2U**

Listen to the podcast in full and:

- Discover something about the sustainability considerations that are integrated into his processing plant's methods and marketing strategies.
- Hear about the new and emerging production technologies he makes mention of, that are used in the processing of lamb meat, and the contribution these new technologies and systems have to the red meat processing industry.
- Learn about any other technologies used at the plant that manage or conserve water and what they have helped the plant do and achieve.
- Find out how the company takes into account animal welfare considerations.
- Explore his description of how the consumer's expectations regarding animal welfare, environmental sustainability, business ethics and workplace practices inform what is undertaken at Gundagai Meat Processors.
- Learn about the hygienic practices, and food safety processes and practices are used at Gundagai Meat Processors, in addition to the quality assurance program that is applied throughout the entire process, from receiving livestock to processing, packaging and shipping to the customer.

Undertake a comparison and analyse videos about the main processing systems used by other red meat processors in Australia. For example Thomas Foods International, an international and domestic processor and supplier located in South Australia **https://vimeo.com/62319210** , and D & S Afflick, a smaller domestic processor who supplies markets in New South Wales **https://youtu.be/y2mPEqIuLVY**

D & S Afflick Abattoirs

Focus on how the smaller domestic processing plant uses and manages water and energy, and reuses and recycles waste products produced there in a state-of-the-art Rendering Plant that can be operated and monitored from a mobile phone. **https://youtu.be/y2mPEqIuLVY**

Discover more about the 'Rendering Plant' located on the Afflick's property and investigate the way all solid waste and blood is recovered and re-used to make tallow for cosmetics and blood and bone products that are on-sold to other companies.

Focus on the way the Rendering Plant also recovers steam and converts it into hot water used within the plant, in basins, sterilisers, hosing down areas and even for the truck wash.

Discuss the automated systems and technologies used by the smaller domestic processor in Moruya NSW and the larger processor in Gundagai NSW. Compare their individual features.

Scott Automation and Robotics

Hear from Project Engineers who design and manufacture meat processing systems that can be installed and maintained in the vast majority of existing meat processing plants. Hear about how they initiate their design projects, execute them, install their designed solution and reflect critically on each step of their process and their final product. **https://youtu.be/4pKzgbypZGM**

Discover more about the automated systems designed by Scott Automation and Robotics who design and manufacture lamb and beef processing systems for a range of meat processors in Australia and New Zealand.
Scott Automation and Robotics- Bladestop **https://youtu.be/OisjwCzLm94**
Scott Automation and Robotics- Lamb Chine **https://youtu.be/pZ0RmFVuJhA**
Scott Automation and Robotics- Robotic lamb processing **https://youtu.be/AT61bXPTFGQ**
Scott Automation and Robotics- X Ray **https://youtu.be/7LQnoOl7qIg**

View a video and talk about Australia's red meat processing sector and the need to share information about the contribution the industry makes to the economy at **https://youtu.be/2uEXcz0EyWA**

Go further, replay the video and and hear about how sustainability considerations have been identified by the red meat processing industry as key to the future of the industry.

Sustainability Considerations

Talk about the word 'sustainability.' As a class consider the differences between 'environmental sustainability', 'economic sustainability' and 'social sustainability'. For example: When a meat processor thinks of being economically sustainable, they might ask themselves a question like 'Are we sustainably profitable?' or 'What do we need to do to make sure that the processing plant provides a living for our family into the future?'.

When a meat processor thinks of being socially sustainable, they might ask themselves a question like 'Are we behaving in a way that the community will support us into the future?' or 'How should we be involved in our community, to support the community and to support us into the future?'

When a meat processor thinks of being environmentally sustainable, they might ask themselves a question like 'Are we maintaining our processing plants and their assets for future generations?' or 'How can we utilise the plant's natural surroundings so that future meat processors can operate successfully in that environment?'

Discuss how many of the processing plants have invested in water and energy recovery processes to increase plant sustainability. Many plants have also reformulated their waste into saleable products. Many have also installed automated systems and robots to enhance labour efficiency, eliminate many physically demanding tasks, and reduce the risk of serious injury to workers.

Discover more information about what actual Australian meat processors are doing to address sustainable practices.

View the ABC Landline episode featuring R Radford and Son at **http://www.abc.net.au/landline/content/2012/s3615247.htm** and focus on the sustainability considerations in which the meat processing company has invested.

Explore how Oakey Beef, in Queensland generate their own energy from their wastewater resources **http://www.ampc.com.au/2016/07/The-Big-Grey-Bubble-Oakey-Beef**.

Research how Gundagai Meats in NSW takes a 'whole-of-lamb' approach to processing, and minimise waste in their operations **http://www.target100.com.au/Farmer-stories/Gundagai-Meat-Processors**

View images and discover how Thomas Foods International in South Australia uses a state-of-the-art wastewater treatment facility to improve its effluent quality by 99.8% and it then also produces enough biogas to offset the site's natural gas requirements. **http://www.ampc.com.au/uploads/images/Meat-Matters/Aust-Meat-Processing-Images/ThomasFoods-Biogas-Skid-&-Flare.JPG**

Delve deeper and discover how a Tasmanian meat processor Greenhams, is using a renewable source of briquette as a bio-fuel in its boilers **https://www.youtube.com/watch?v=cOrBAd7-Pfo&feature=youtu.be**

Consider the differences between 'environmental sustainability', 'economic sustainability', 'social sustainability' and 'political sustainability'.

Develop a concept map describing what students know about the sustainable meat processing and production, including small scale processing and production, large scale processing and production and commercial scale processing and production in the red meat industry.

Build on understandings by sharing concept maps and ideas.

Take this a step further, and ask students to define the meaning of 'sustainability' as it applies to red meat processing. See **Resource 1.3.1**.

Animal welfare and ethical considerations

Talk about 'animal welfare' and introduce the *Model Code of Practice for the Welfare of Animals* — (Model Code) which is a national code endorsed by the Australian Commonwealth, State and Territory, and Ministers for Primary Industries. Talk about the objective of the Model Code of Practice which aims to detail minimum standards for the welfare of a range of livestock. Explain how the focus is on processing systems and the needs of livestock rather than consumer expectations. See **http://www.agriculture.gov.au/animal/welfare/standards-guidelines**

Hear from Ms. Temple Grandin, who is dedicated to better understanding animal rights and incorporates these understandings into her designs of meat processing plants at **https://www.youtube.com/watch?v=Oy-kAW3beqc**

Sketch and label what a possible processing system that focuses on animal welfare might look like. Might it play classical music, have curved entrances, non-slip flooring, feed the livestock silage laced with an anaesthetic?

Collate ideas about the industry, its processing methods and standards, and how these have changed over time using iThoughts, a mind mapping app or map ideas using a concept mapping technique.

Talk about the word 'ethical'. How might the students describe an ethical way to process cattle, sheep and goats? What might they need to be processed ethically?

Expand the topic and talk about ethical marketing and labelling on red meat products. Hear from one customer about ways processors and their products are regarded locally and overseas and ways they might value add to their products **https://youtu.be/L51CoN4P3ZQ**

Hear from an Australian processor describing how animal welfare, sustainability and worker considerations form the basis of processing operations in many plants **https://youtu.be/1F_F-wu9pQQ**

Encourage students to revisit earlier videos or find additional examples of what actual meat processors are doing to address ethical and sustainable processing methods and bring their findings back to class. Share these to build a bigger picture of what is happening in the industry.

A SWOT Analysis

Introduce a SWOT analysis. Talk about 'SWOT' being an acronym for **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats and how a **SWOT** analysis can help identify vital areas to either emphasise or improve in terms of meat processing.

Model the use of a SWOT analysis using a locally relevant example.

View a range of videos about meat processing systems that have integrated automated systems and robots into the way they process carcasses and analyse whether the systems portrayed are committed to sustainable and ethical principles, using a SWOT analysis.

Video 1 is about "Bladestop", an automated system that cuts red meat and mechanically stops the bandsaw blade when the unit senses that a person has come within one millimetre of the blade and improves safety for all of the team working there **https://www.youtube.com/watch?v=NiRegdech_E&feature=youtu.be**

Video 2 is about a South Australian processor who has integrated innovative technologies into their plant using a robotic cutting system that reads information from x-ray data and delivers improved cutting accuracy at **https://www.youtube.com/watch?v=za2dsB0qrMg**

Video 3 explores a NZ processor in which only robots and automated systems process and bone a carcass of lamb into a variety of different cuts of meat at **https://www.youtube.com/watch?v=MZIv6WtSF9I**

Video 4 features a NSW processor who has installed an industrial robot to steam clean lamb carcasses, kill bacteria and remove any contaminants via a vacuum. **https://youtu.be/bZKSsHXO6rc**

Using Resource 1.3.2, ask students to undertake a SWOT analysis and:

- Identify the strengths of the processing system featured.
- Identify the weaknesses of the processing system shown.
- Identify real opportunities that the processing system featured offers in terms of sustainable and ethically produced red meat products.
- Identify real threats that might impact on industry's suggestions that they are committed to producing sustainable and ethically processed and produced red meat products.

Ask students to clarify ideas and explanations and summarise these in written form.

Marketing and labelling

Delve deeper into the current trends and changing consumer patterns and consider how these might influence the way processors market or educate Australian consumers about their products **https://youtu.be/RxROfMj-Fqg**

Look at the way meat processors label, brand and market their meat products. Ask students to locate a range of labels and brands. Examine and analyse these and the language used to market them, and talk about 'truth in labelling'. Discuss what the following descriptions might imply to consumers:

- Meat Standards Australia (MSA) Graded;
- 100% grass fed;
- No hormones, Genetically Modified Organisms (GMOs) or antibiotics;
- Premium offering;
- Consistently tender, juicy and flavoursome;
- 100% Halal certified;
- Classic brand;
- Supreme brand; and
- Consumer brand.

Discuss whether any of the claims might mislead consumers? If so, how do they mislead the consumer? What tactics, tools, wording or imaging is used? What might be omitted or included?

Consider whether consumers could have suffered any detriment due to any misleading claims for red meat products. Similarly, consider any detriment processors and retailers may have suffered due to any misleading claims made by competitors.

Explore issues about the ethical and sustainable production and marketing of red meat products, raised using De Bono's "Six Thinking Hats". See **Resource 1.3.3**.

Ask student pairs to share these understandings with others.

Ask each team to share what their research has told them and what they still have to accomplish within the task with their peers, the teacher and family.

Prerequisite for progression:

Students have worked as a class, individually and in teams and collected research on how Australian meat processors produce an array of different beef, lamb and goat meat cuts for local, national and international markets, while using highly skilled people in addition to innovative automated technology systems and robotics.

Websites, videos, images and stories are used to contextualise understanding. Students will share their ideas with peers, the teacher and family.

Step 4: Dream

Objective: Ask students to imagine how they are going to design a next evolution of Meat Processing Plant using emerging sciences and technologies, and the Internet of Things. Ask students to visualise their identification system that shows all the on-site processing system considerations, and a script for a commercial, advertising the new processing plant, and what it processes and produces.

Ask students in their teams, to create a vision for their next evolution of meat processing plant.

Share **Resource 1.4** and ask questions like:

- On which aspects of sustainability and ethical processing, production and marketing do you want to focus?
- How might you integrate these considerations into the meat processing plant?
- Can you imagine a way to incorporate 'drones' or 'Unmanned Airborne Systems' (UAS) into the plant?
- Could drones and UAS's make assessments about sustainable and ethical processing processes that might be useful to the industry?
- Can you imagine how 'sensors' might be used in a plant to relay vital information about how the livestock arrive at the plant; how they're grouped and placed in holding yards; how they are provided with water, food and shelter; how they are led into the plant; how they are hung, bled, and trimmed to a set standard; how they are graded according to AUS-Meat standards; how they are chilled, branded, weighed and packaged?
- Might you design such a system of 'sensors'?
- Can you imagine how and where to place 'scanning' technologies?
- How might your design incorporate odour technologies?
- Will your design incorporate water recycling technology, effluent re-use or any renewable energy technologies?
- Will your design incorporate 'robots'? How might they enhance labour efficiency, eliminate many physically demanding tasks, and reduce the risk of serious injury to workers?
- Could insensibility gases be part of the animal welfare system? Might curved races help livestock not see people ahead of them?
- Could 3D stereo cameras, optical floor sensors, nano-technologies and the 'Internet of Things' be part of meat processing systems in the next century?
- How do you want consumers to respond when they read labelling, branding and marketing claims?
- How do you want the site's staff members to respond when they read the poster in the plant's site-office?

View the video that features Project Engineers from Scott Automation & Robotics and analyse what influences the designs they undertake for the meat processing sector, especially those used to move the carcasses, clean them, x-ray bone structure, cut carcasses, bone carcasses and package, weigh and label them. (**https://youtu.be/4pKzgbypZGM**)

Ask students to visualise their systems that can manage water, energy and waste productively, handle animals ethically at a meat processing plant, and in a way that helps tell the story and create new narratives about how meat is processed and produced in the next evolution.

Develop possible solutions by brainstorming possible solutions.

Brainstorm all possible solutions.

Ask students to imagine the steps involved in designing their work samples.

Check out a design plan and an image of a 'generic' meat processing plant. Use it to draft your design ideas. See **Resource 1.5**.

Challenge students to think about the materials, tools, and equipment they will need to design their individual work samples. Will they use digital or non-digital equipment and tools?

Ask students how they might communicate the ways their design ideas, technologies, systems and solutions help meat processors manage customer expectations, and reduce impacts on the environment.

Progressions for Learning:

The class have brainstormed ideas to begin designing their next evolution of meat processing plant. They have visualised their plant, identification system that shows all the on-site sustainability and ethical considerations, and a script for a commercial to advertise the plant and what it processes and produces, and have answered the questions posed in the dream phase.

Step 5: Design

Objective: Ask students to explain, prepare and action how they are going to design the next evolution of meat processing plant using emerging sciences, technologies, and the Internet of Things. They also design an identification system that shows all the on-site sustainability and ethical considerations, and a script for a commercial to advertise the plant and what it processes and produces.

Ask students to decide on the systems they are going to design into their next evolution of meat processing plant with an identification system that shows all the on-site sustainability and ethical considerations. Invite students to think about being a change-maker, an innovator, a thinker, a designer and a creator, and begin their project planning using templates in **Resource 1.6**.

Talk about the importance of a clear layout and design that makes it easy for an audience to understand and interpret the information given.

Discuss the importance of including information in the design about how the systems and technologies:

- manage water, energy and waste productively,
- treat the livestock ethically,
- reduce manual handling and repetitive work,
- reduce the risk of injuries,
- maintain equipment,
- collect data for the processor,
- make money or save money, and
- help meat processors market a quality product credibly.

Talk about the importance of sourcing graphics, photos and information correctly.

Review rules on personal safety, group safety, and classroom and furniture safety with the students. Ask students to establish a workstation and to gather the materials and tools they require. Talk about storing their design safely and keeping a record of the processes they use to create it.

Ask students to draft the steps involved in making their chosen digital or non-digital design. See **Resource 1.6**.

Ask students to gather the materials, tools, and equipment needed and then plan each step involved in creating the digital or non-digital design. Invite students to start creating the design of the meat processing plant identification system that shows all the on-site sustainability and ethical considerations. Remind students about the need to also write a script for a commercial to advertise the plant and what it processes and produces.

Talk with students about how they might share and present their designs to an audience?

Ask students to explain how they plan to finalise and create their designs with another peer in the class and seek feedback on their ideas.

Progressions for Learning:

Students are able to document in oral or written/digital forms how this project is to occur. The understanding is demonstrated by the students explaining their thinking to a peer in the class.

Step 6: Deliver- produce

Objective: Have students deliver their design of the next evolution of meat processing plant using emerging sciences, technologies, and the Internet of Things. They also design an identification system that shows all the on-site sustainability and ethical considerations, and a script for a commercial to advertise the plant and what it processes and produces.

The Delivery phase has two stages – production and publication. In the production stage the project comes to life – this is the doing phase. At the end of this phase, the publication/presentation of the design of the next evolution of meat processing plant with an identification system that identifies ways it integrates on-site sustainability and ethical considerations should be completed. Similarly, the design of the script for a commercial to advertise the plant and what it processes and produces should also be completed.

Ask students to design and create their individual work samples required in this unit, including their:

- design the next evolution of meat processing plant with an identification system that identifies ways it integrates on-site sustainability and ethical considerations;
- script for a commercial to advertise the plant and what it processes and produces.

In the Publish phase, students get to showcase all of their thinking and planning. This is the time when students present their designs to each other or an audience, and is a good time for peer or self-assessment.

Ask students to share their designs with others.

Video student presentations and if possible, enjoy a day of learning about how Australian meat processors might process meat in the next evolution of meat processing plants.

Progression for learning:

Each pair of students has produced designs featuring the next evolution of meat processing plant using emerging sciences, technologies, and the Internet of Things with an identification system that shows all the on-site sustainability and ethical considerations. The students have also designed and written a script for a commercial to advertise the plant and what it processes and produces. Each team of students has also presented their design to an audience.

Step 7: Debrief

Objective: Assess the results of the designs featuring the next evolution of meat processing plant using emerging sciences, technologies, and the Internet of Things with an identification system that shows all the on-site sustainability and ethical considerations. Assess the script for a commercial to advertise the plant and what it processes and produces.

Ask students to reflect on their learning. See **Resource 1.7** and ask students to:

Re-tell their findings about the ways Australian meat processors use processing technologies and systems to bring consumers quality cuts of meat to eat.

Describe the processes they used in their designs of the next evolution of meat processing plant with an identification system that shows all the on-site sustainability and ethical considerations, and their script for a commercial to advertise the plant and what it processes and produces.

Evaluate their designs and write four sentences about whether each design:

- matched the definition of the task
- used a clear layout and design
- was feasible, and
- included sources of the ideas and information each design piece used.

Write about the quality of their planning, their finished design and whether they enjoyed the task.

Reflect on the learning by inviting students to complete a self-assessment activity. Ask questions like:

- How has my/our attitude and behaviour changed as a result of my learning?
- How well did I/we contribute to any pair/team learning activities?
- How can I/we apply what I/we have learned to another topic?

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IDEAS
DANGER
ABB

The essential question:

What benefits accrue to the consumer and processor when we have an understanding of the processing technologies and systems used by Australian red meat processors to bring us quality cuts of meat?

How does an understanding of the challenges and opportunities that exist, including sustainability considerations, consumer expectations, marketing techniques and media coverage, affect our decision-making about what red meat products we buy?

Step 1: The scenario

The Australian Meat Processor Corporation (AMPC) is encouraging schools to discover how Australian meat processors might produce an array of different beef, lamb and goat meat cuts for local, national and international markets, while using highly skilled people, in addition to innovative automated technology systems and robotics.

When consumers buy beef, lamb or goat meat at the butcher or supermarket, all the hard work and innovation that goes into producing the cuts of meat we love to eat is not immediately obvious.

Discover ways red meat processing companies are using, ethical and sustainable production techniques, technologies and systems, and how they are marketing their products.

Explore how ethics, social values, profitability and sustainability considerations impact or influence the design and workings of some processing plants, and the processes and technologies used.

Examine the wide diversity and commonalities of red meat processing plants and their operating systems.

What makes red meat processing plants and their systems interesting to study is their wide diversity and commonalities throughout the world. Some are dominated by processing meat products for export, while others are devoted to processing meat products for domestic consumption. Some processing plants are highly mechanised, others aren't. Some use robotics, others don't. Some are using automated meat processing systems that reduce manual handling and provide a consistent flow of product, while others are using x-ray technology to measure carcass dimensions to optimise cutting accuracy.

Many processing plants have invested in water and energy recovery processes to increase plant sustainability. Many plants have also reformulated their waste into saleable products. Many have also installed automated systems and robots to enhance labour efficiency, eliminate many physically demanding tasks, and reduce the risk of serious injury to workers.

Could future processing plants use drones to move their product? Could processing plants use drones to take photographs or video parts of the processing sequence and gather data to inform the processing of red meats? Could 3D stereo cameras, optical floor sensors, nano-technologies and the 'Internet of Things' be part of meat processing systems in the next century?

What investigations can assist you to research how Australian meat processors use the latest processing technologies and systems? What investigations can assist you to research how they use robotics? Will you investigate how Australian meat processors currently automated systems in the form of robotic sensing and cutting? Will you investigate how Australian meat processors use x-ray systems that create 3D maps of the bones within lamb carcasses which then provide data to robots and help them cut carcasses with accuracy far greater than human capabilities? Will you investigate whether any Australian meat processors currently use robotics and x-rays systems?

AMPC and other meat processors can help out with lots of information, images and videos on their websites. **http://www.ampc.com.au/education-training/school-resources/aust-meat-processing**

Your challenge is to use the websites and a range of activities and videos to help understand how Australian meat processors produce an array of different beef, lamb and goat meat cuts for local, national and international markets, while using highly skilled people in addition to innovative automated technology systems and robotics. How will you design the next evolution of Meat Processing Plant in this project? How will your systems work? How might you present your design to others?

Become a Project Designer and use a range of activities, videos, images, information and websites containing information about red meat processing systems in Australia to design a next evolution of meat processing plant.

As part of a Design Team, record and collect information about the systems and technologies used to process and bring red meat products to consumers.

Investigate the current practices used by the industry, envision alternatives and explain how red meat processing systems and products can evolve with consideration for preferred futures and the emergence of new ideas and technologies that could be used in red meat processing, production and event marketing.

Re-imagine processing methods that feature ideas for the future and emerging technologies, and produce drawings to explain your design ideas. Your team is also asked to communicate your ideas to an audience later in the unit.

The team is tasked then with designing an identification system that can be applied through a meat processing plant that shows all the on-site processing system features. In particular, you are tasked with showing all the on-site sustainability and ethical considerations within the processing practices.

In addition, you are required to write a script for a great commercial to advertise your new meat processing plant, what it processes and produces.

Finally, each team is required to give a five minute presentation of the design and commercial to an audience, in which you explain how red meat could be processed and marketed in the future.

Put your design mojo to work and design the next evolution of Meat Processing Plant using emerging sciences and technologies, and the Internet of Things.

AMPC invites you, through collaboration and clever thinking, to provide the best solutions for their industry.

High, low and no tech options are available.

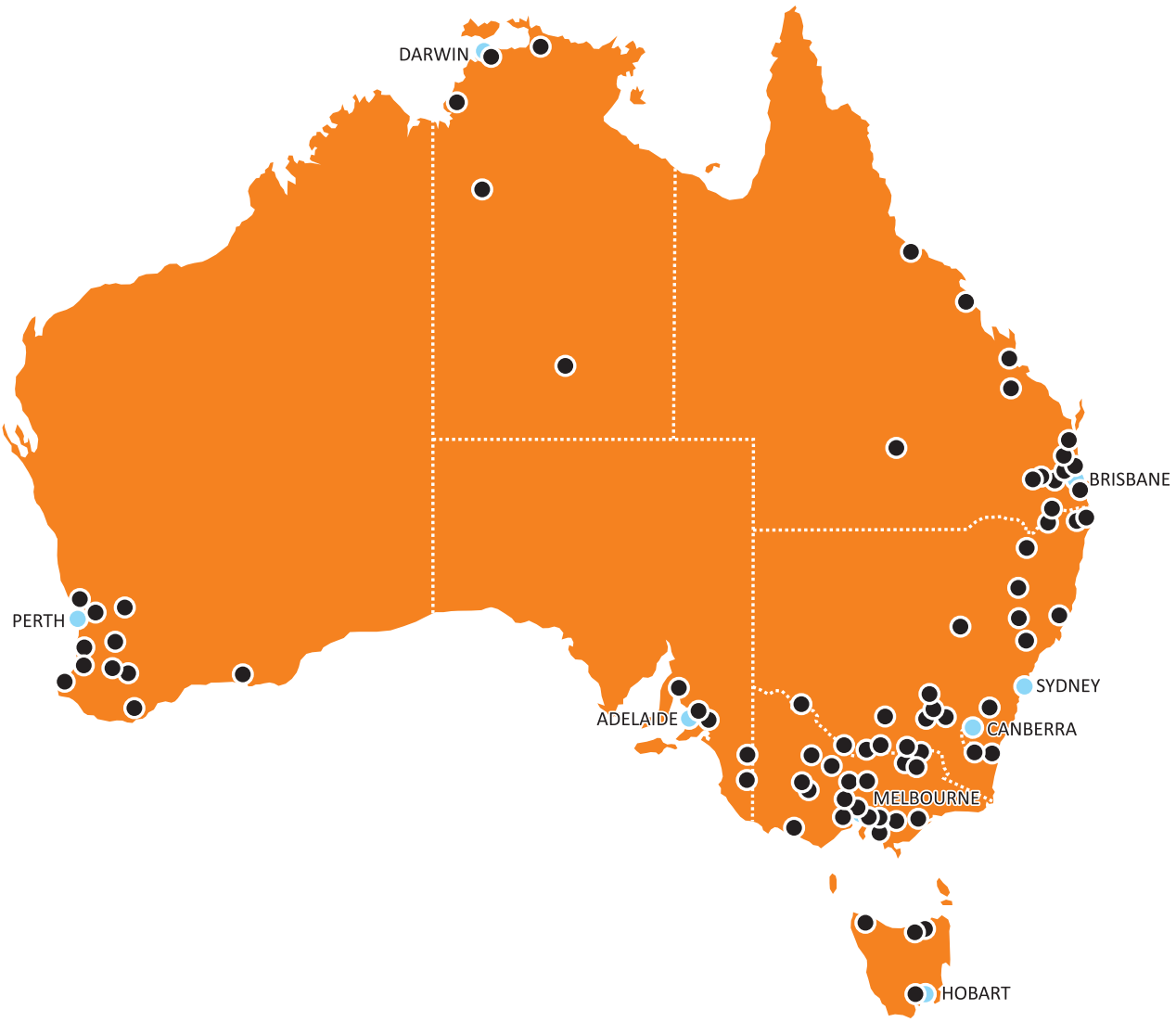
High Tech: You can design and produce your next evolution of Meat Processing Plant digitally using an app or software to create original graphics. You can also design your identification system and commercial digitally using software to create original graphics.

Low Tech: You can design and produce your next evolution of Meat Processing Plant using a standard computer, graphics provided and editing software. You can also design your identification system and commercial digitally using a standard computer.

No Tech: You can design and produce your next evolution of Meat Processing Plant using art materials, poster board and hand written information and drawings. You can also design your identification system and commercial digitally using art materials, poster board and hand written information and drawings.

What kind of researcher and project designer will you be?

Locate where Australian meat processors are situated and which ones might process red meat products in your state or territory.



Define

Submit a written definition of the challenges you are to undertake.

Discover

In this stage, the research and digging begins. This involves obtaining the background information that gives the problem its context, and identifying what you need to know and what you need to be able to do to solve the problem.

Links for Research and Reference

View a sample of website materials, videos, print materials and social media tools that cover various meat processing systems, marketing and labelling topics.

Examples include:

- Thomas Foods International
  http://thomasfoods.com/
- Gundagai Meat Processors
  http://www.gmpgundagai.com.au/
- Fletchers International Exports
  http://www.fletchint.com.au/
- JBS Australia
  http://www.jbssa.com.au/
- Teys Australia
  http://www.teysaust.com.au/

Gundagai Meat Processors

View a video and discover the more about the automated systems and robotics that are installed at Gundagai Meat Processors in New South Wales. Hear about the 'Brisket saw' that delivers highly accurate cutting of the lamb carcasses, with a consistent flow of product. Discover more about the 'Sani – Vac' that replaces manually using steam and heavy equipment to vacuum and sanitise each carcass by removing bone dust or contaminants on the carcass itself. Look for other automated systems that move the lamb meat, cut them, package and x-ray them before being boxed and labelled for distribution throughout southern Australia.
https://youtu.be/bZKSsHXO6rc

Listen to a podcast and hear from Mr. Will Barton, the CEO of Gundagai Meat Processors (GMP) and the systems and technologies used at the plant to ensure sustainable and ethical processing and production of lamb. Find out what Will says about how Gundagai Meat Processors use sustainable resource management practices to process lamb.

Discover something about the sustainability considerations that are integrated into his processing plant's methods and marketing strategies.

Hear about the new and emerging production technologies he makes mention of, that are used in the processing of lamb meat, and the contribution these new technologies and systems have to the red meat processing industry**.**

Learn about any other technologies used at the plant that manage or conserve water and what they have helped the plant do and achieve.

Find out how the company takes into account animal welfare considerations.

Explore his description of how the consumer's expectations regarding animal welfare, environmental sustainability, business ethics and workplace practices inform what is undertaken at Gundagai Meat Processors.

Learn about the hygienic practices, and food safety processes and practices are used at Gundagai Meat Processors, in addition to the quality assurance program that is applied throughout the entire process, from receiving livestock to processing, packaging and shipping to the customer.

Undertake a comparison and analyse videos about the main processing systems used by other red meat processors in Australia. For example Thomas Foods International, an international and domestic processor and supplier located in South Australia **https://vimeo.com/62319210** , and D & S Afflick, a smaller domestic processor who supplies markets in New South Wales.

D & S Afflick Abattoirs

Focus on how the smaller domestic processing plant uses and manages water and energy, and re-uses and recycles waste products produced there in a state-of-the-art Rendering Plant that can be operated and monitored from his mobile phone. **https://youtu.be/y2mPEqIuLVY**

Discover more about the 'Rendering Plant' located on the Afflick's property and investigate the way all solid waste and blood is recovered and re-used to make tallow for cosmetics and blood and bone products that are on sold to other companies.

Focus on the way the Rendering Plant also recovers steam and converts it into hot water used within the plant, in basins, sterilisers, hosing down areas and even for the truck wash.

Discuss the automated systems and technologies used by the smaller domestic processor in Moruya, NSW and the larger processor in Gundagai, NSW. Compare their individual features.

Scott Automation and Robotics

Hear from Project Engineers who design and manufacture meat processing systems that can be installed and maintained in the vast majority of existing meat processing plants. Hear about how they initiate their design projects, execute them, install their designed solution and reflect critically on each step of their process and their final product.
https://youtu.be/4pKzgbypZGM

Discover more about the automated systems designed by Scott Automation and Robotics who design and manufacture lamb and beef processing systems for a range of meat processors in Australia and New Zealand.
Scott Automation and Robotics- Bladestop
https://youtu.be/OisjwCzLm94
Scott Automation and Robotics- Lamb Chine
https://youtu.be/pZ0RmFVuJhA
Scott Automation and Robotics- Robotic lamb processing
https://youtu.be/AT61bXPTFGQ
Scott Automation and Robotics- X Ray
https://youtu.be/7LQnoOl7qIg

View a video and talk about Australia's red meat processing sector and the need to share information about the contribution the industry makes to the economy at **https://youtu.be/tv7o9SkN8PI**

Go further, replay the video and hear about how sustainability considerations have been identified by the red meat processing industry as key to the future of the industry.

Sustainability Considerations

Discover more about: R Radford and Son at **http://www.abc.net.au/landline/content/2012/s3615247.htm** and focus on the sustainability considerations in which the meat processing company has invested.

Consider the plant upgrades that have included temperature controlled chilling to enhance eating quality, and the investment in water and energy recovery projects to increase plant sustainability.

Discover how this processing plant uses 100,000 litres of water a day. Brainstorm and list all the processes that might use water at the plant and consider ways that any processor might be able to undertake to conserve or re-use water.

Explore how Oakey Beef, in Queensland generate their own energy from their wastewater resources **http://www.ampc.com.au/2016/07/The-Big-Grey-Bubble-Oakey-Beef**.

View the video and discover how the processor demonstrates environmental responsibility and stewardship by using wastewater and bacteria to create electricity.

Research how Gundagai Meats in NSW takes a 'whole-of-lamb' approach to processing, and minimise waste in their operations **http://www.target100.com.au/Farmer-stories/Gundagai-Meat-Processors**

View images and discover how Thomas Foods International in South Australia uses a state-of-the-art wastewater treatment facility to improve its effluent quality by 99.8% and it then also produces enough biogas to offset the site's natural gas requirements. **http://www.ampc.com.au/uploads/images/Meat-Matters/Aust-Meat-Processing-Images/ThomasFoods-Biogas-Skid-&-Flare.JPG**

Delve deeper and discover how a Tasmanian meat processor 'Greenhams' is using a renewable source of briquette as a bio-fuel in its Boilers **https://www.youtube.com/watch?v=cOrBAd7-Pfo&feature=youtu.be**

View and listen to the AMPC video showcasing the views of various stakeholders around the sustainability issues affecting Australia's red meat manufacturing industry **http://feastofideas.com/welcome**

Read about what a scientist suggests can be recycled and reused from meat processing plants **http://www.awmc.uq.edu.au/dr-paul-jensen**

Record any ideas that are suggested by the scientist, about resources that can be recovered in meat processing operations.

Animal welfare and ethical considerations

Find out about the *Model Code of Practice for the Welfare of Animals* — (Model Code) which is a national code endorsed by the Australian Commonwealth, State and Territory, and Ministers for Primary Industries. Talk about the objective of the Model Code of Practice which aims to detail minimum standards for the welfare of a range of livestock. Explain how the focus is on processing systems and the needs of livestock rather than consumer expectations. See **http://www.agriculture.gov.au/animal/welfare/standards-guidelines**

Hear from Ms. Temple Grandin, who is dedicated to better understanding animal rights and incorporates these understandings into her designs of meat processing plants at **https://www.youtube.com/watch?v=Oy-kAW3beqc**

Sketch and label what a possible processing system that focuses on animal welfare might look like. Might it play classical music, have curved entrances, non-slip flooring, feed the livestock silage laced with an anaesthetic?

Collate ideas about the industry, its processing methods and standards, and how these have changed over time using iThoughts, a mind mapping app or map ideas using a concept mapping technique.

Think about the word 'ethical'. How might the students describe an ethical way to process cattle, sheep and goats? What might they need to be processed ethically?

Hear from one customer about ways processors and their products are regarded locally and overseas and ways they might value add to their products **https://youtu.be/L51CoN4P3ZQ**

Hear from an Australian processor describing how animal welfare, sustainability and worker considerations form the basis of processing operations in many plants **https://youtu.be/1F_F-wu9pQQ**

If necessary, revisit earlier videos or find additional examples of what actual meat processors are doing to address ethical and sustainable processing methods for your research task.

Marketing and labelling

Delve deeper into the current trends and changing consumer patterns and consider how these might influence the way processors market or educate Australian consumers about their products **https://youtu.be/RxROfMj-Fqg**

Look at the way meat processors label, brand and market their meat products. Ask students to locate a range of labels and brands. Examine and analyse these and the language used to market them, and talk about 'truth in labelling'. Discuss what the following descriptions might imply to consumers:

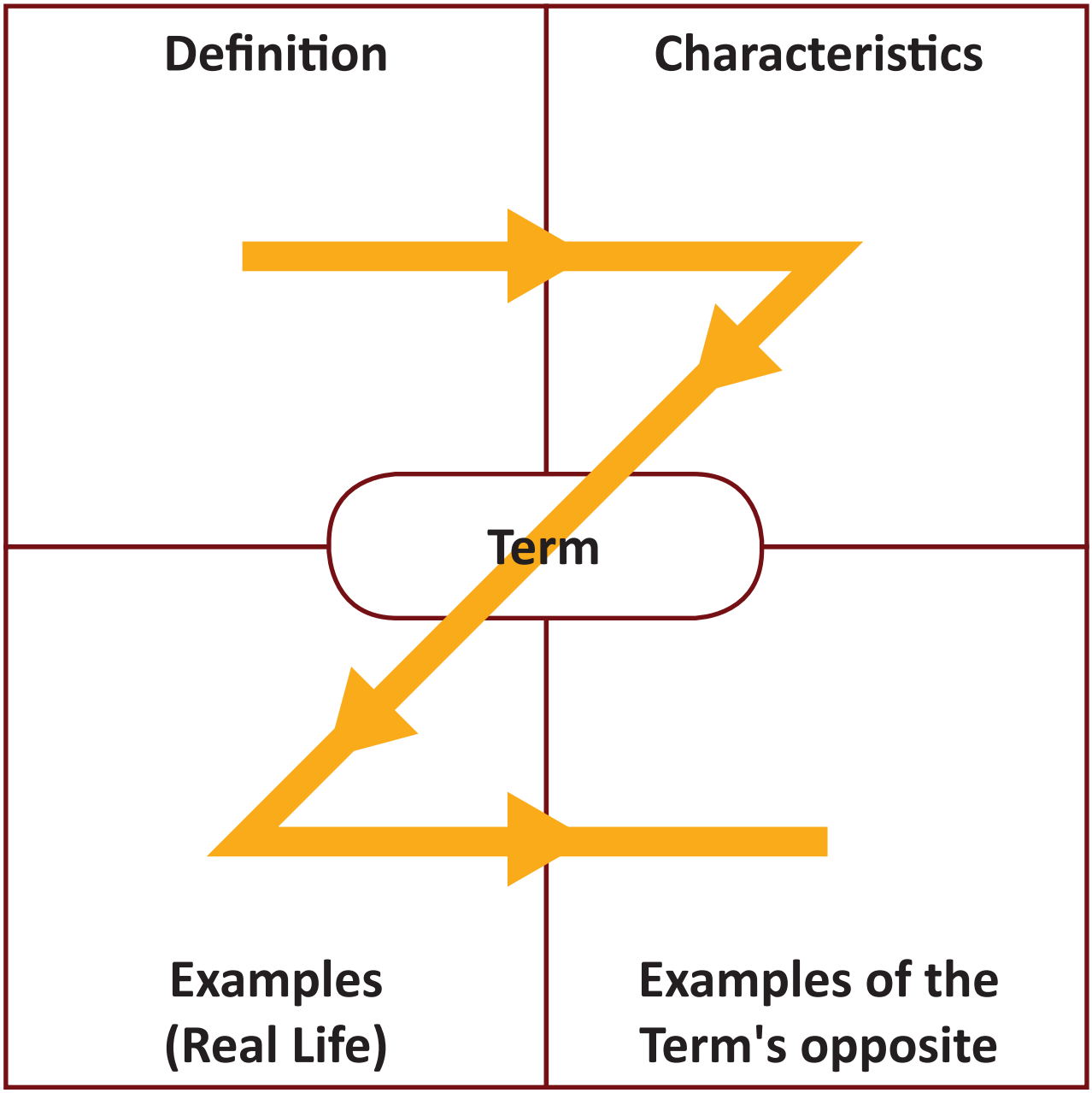
- Meat Standards Australia (MSA) Graded;
- 100% grass fed;
- No hormones, Genetically Modified Organisms (GMOs) or antibiotics;
- Premium offering;
- Consistently tender, juicy and flavoursome;
- 100% Halal certified;
- Classic brand;
- Supreme brand; and
- Consumer brand.

Discuss whether any of the claims might mislead consumers? If so, how do they mislead the consumer? What tactics, tools, wording or imaging is used? What might be omitted?

Consider whether consumers could have suffered any detriment due to any misleading claims for red meat products. Similarly, consider any detriment processors and retailers may have suffered due to any misleading claims made by competitors.

Record and refine your ideas about the meaning of 'sustainability' as it applies to meat processing.

The sequence in which you utilise the graphic is highlighted by the dotted lines and arrows.



SWOT Analysis

'SWOT' is an acronym for **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats.

A SWOT analysis can help identify vital areas of a topic to either emphasise or improve.

Use the following links and undertake a SWOT analysis of the automated systems and technologies being used in the meat processing industry.

Video 1 'Bladestop', an automated system that cuts red meat and mechanically stops the bandsaw blade when the unit senses that a person has come within one millimetre of the blade and improves safety for all of the team working there **https://www.youtube.com/watch?v=NiRegdech_E&feature=youtu.be**

Video 2 is about a South Australian processor who has integrated innovative technologies into their plant using a robotic cutting system that reads information from x-ray data and delivers amazing cutting accuracy at **https://www.youtube.com/watch?v=5NRZaiZ9EnM**

Video 3 explores a NZ processor in which only robots and automated systems, process and bone a carcass of lamb into a variety of different cuts of meat **https://www.youtube.com/watch?v=MZIv6WtSF9I**

Video 4 features a NSW processor who has installed an industrial robot to steam clean lamb carcasses, kill bacteria and remove any contaminants via a vacuum. **https://youtu.be/bZKSsHXO6rc**

Analyse what influences the design of the processing systems featured in the videos. Might there be ergonomic influences; health and safety influences; economic, welfare or sustainability influences?

What do you think are:

- The strengths of the processing system featured?
- The weaknesses of the processing system shown?
- The real opportunities that the processing system featured offers in terms of sustainable and ethically produced red meat products?
- The real threats that might impact on industry's suggestions that they are committed to producing sustainable and ethically processed and produced red meat products?

De Bono's Six Thinking Hats

Explore the issues you uncovered about the ethical and sustainable production and marketing of red meat products. Use the six thinking hats below to think through the issues according to each coloured hat and the question asked.

RED HAT

Feelings

What are the emotions and feelings associated with how beef, lamb or goat meat are processed and marketed? How do you feel about this?

WHITE HAT

Information

List the facts that you know about regarding how beef, lamb and goat meat are processed and marketed?

BLUE HAT

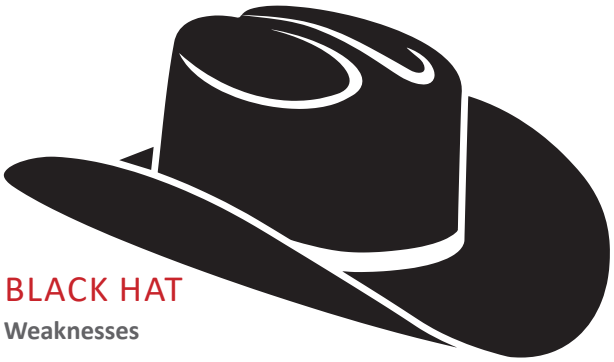
What thinking is needed?

What has happened so far?
What should happen next?
What questions should we consider?

GREEN HAT

New ideas

How could the problems related to meat processing and marketing systems be solved? What needs to be done?



BLACK HAT

Weaknesses

What are some of the negative aspects and outcomes of seeking new ways to process and market red meat?

YELLOW HAT

Strengths

What are some of the positive aspects and outcomes of seeking new ways to process and market red meat?

Dream

This is where you use the knowledge you've gathered to visualize a creative and appropriate solution. This is an holistic process where we imagine what the solution will appear like as it would in the future. Instead of asking "why" we ask "why not?" The question of "what's the worst that could happen" becomes "what's the best that could happen?"

Consider the many possible ways you can design a next evolution of meat processing plant.

On which aspects of sustainability and ethical processing, production and marketing do you want to focus?

How might you integrate these considerations into the meat processing plant?

Can you imagine a way to incorporate 'drones' or 'Unmanned Airborne Systems' (UAS) into the plant?

Could drones and UAS's make assessments about sustainable and ethical processing processes that might be useful to the industry?

Can you imagine how 'sensors' might be used in a plant to relay vital information about how the livestock arrive at the plant; how they're grouped and placed in holding yards; how they are provided with water, food and shelter; how they are led into the plant; how they are hung, bled, and trimmed to a set standard; how they are graded according to AUS-Meat standards; how they are chilled, branded, weighed and packaged?

Might you design such a system of 'sensors'?

Can you imagine how and where to place 'scanning' technologies?

How might your design incorporate odour technologies?

Will your design incorporate water recycling technology, effluent re-use or any renewable energy technologies?

Will your design incorporate 'robots'? How might they enhance labour efficiency, eliminate many physically demanding tasks, and reduce the risk of serious injury to workers?

Could insensibility gases be part of the animal welfare system? Might curved races help livestock not see people in the lairage, ahead of them?

Could 3D stereo cameras, optical floor sensors, nano-technologies and the 'Internet of Things' be part of meat processing systems in the next century?

How do you want consumers to feel when they read labelling, branding and marketing claims?

How do you want the site's staff members to feel when they work in the plant?

Visualise your systems that can manage water, energy and waste productively, and handle animals ethically at a meat processing plant, and in a way that helps tell the story and create new narratives about how meat is processed and produced in the next evolution of meat processing plants.

Develop possible solutions by brainstorming all solutions.

Visualise your creative direction for their next evolution of meat procesing plant, identification system, and commercial.

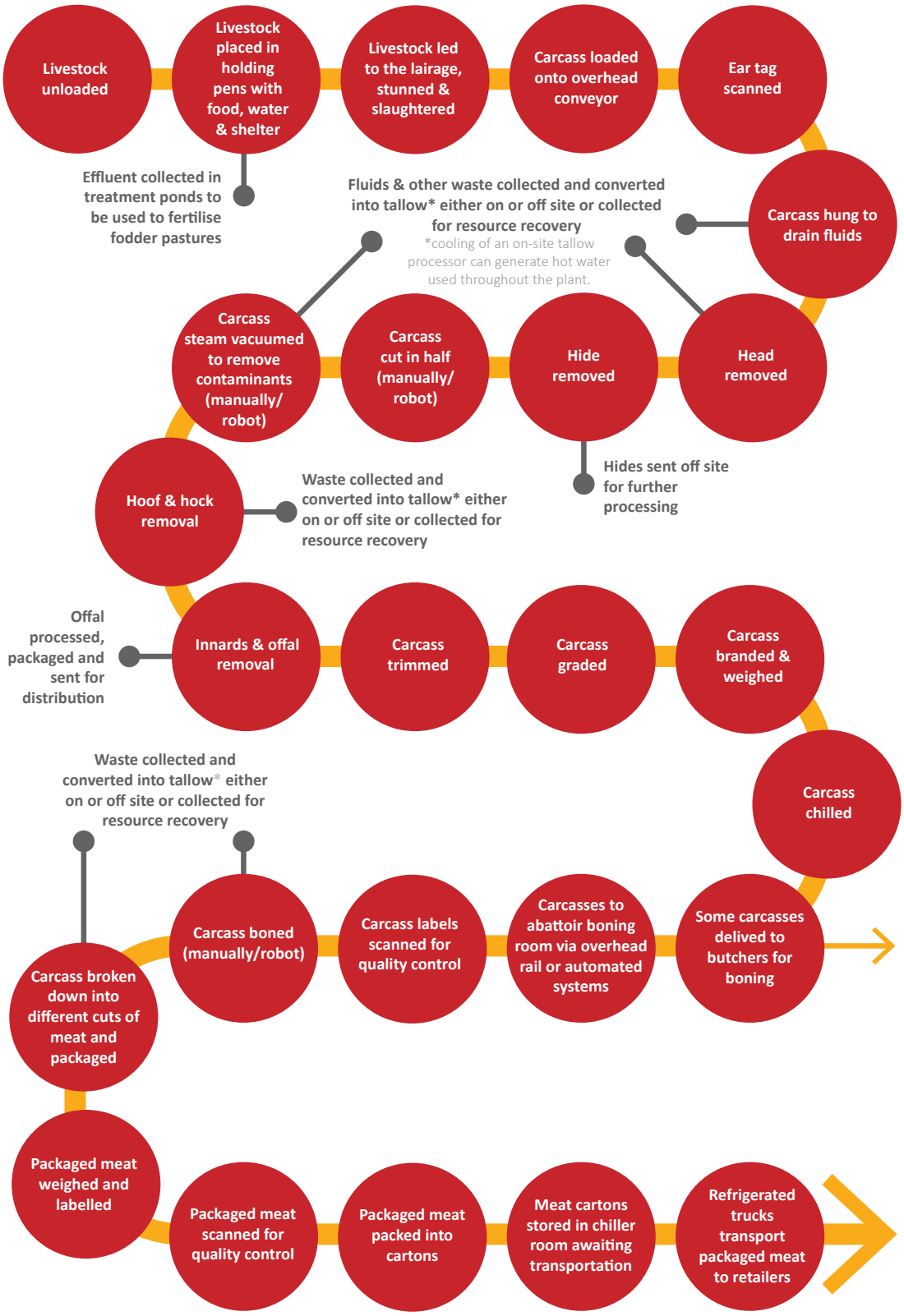
Imagine the steps involved in designing your next evolution of processing plant, poster and brochure.

Think about the materials, tools, and equipment they will need to design your individual work samples. Will you use digital or non-digital equipment and tools?

How might you communicate the ways your design ideas, technologies, systems and solutions help meat processors manage customer expectations, and reduce impacts on the environment.

Plan of a Meat Processing Plant

Check out a design plan of a 'generic' meat processing plant. Review all the steps involved in meat processing. Then, using this information and the outline of a generic meat processing plant on the next page, draft your design ideas.



1 Stock yard
2 Slaughter house
3 Boning room
4 Chilling room
5 Packaging & transport
6 Rendering plant

Design

Commence by establishing your desired outcome; then visualise the various steps necessary to achieve the visualized solution in measurable, achievable steps.

Prepare a project plan to outline information that needs to be gathered, who is responsible, where you will seek information from, and how it will be gathered. Try and work out the order in which you are going to do things when researching and designing. Knowing what you have to complete, and in which order, will help you organise your time better during the project. Write it down as a suggested order of work.

What do I need to do?	How will I gather the information? How will I create my designs?	When will I do this?	How can my products and processes be improved?

Or, consider another type of Project Plan. Consider a plan with the following headings.

What	How	When	Who and what's needed	How will we know if it worked

You may like to sequence an order of work

Step 1	
Step 2	
Step 3	
Step 4	
Step 5	
Step 6	
Step 7	
Step 8	
Step 9	
Step 10	
Step 11	
Step 12	

Remember your task is to design their next evolution of meat processing plant with an identification system that shows all the on-site sustainability and ethical considerations.

Remember to include information in the design about how the systems and technologies manage water, energy and waste productively, treat the livestock ethically, reduce manual handling and repetitive work, reduce the risk of injuries, maintain equipment, collect data for the processor, make money or save money, and help meat processors market a quality product credibly.

Don't forget about the importance of sourcing graphics, photos and information correctly.

Review rules on personal safety, group safety, and classroom and furniture safety with the team. Establish a workstation and gather the materials and tools you need. Store your design safely and keep a record of the processes the team uses to create it.

Draft the steps involved in making their chosen digital or non-digital design.

Gather the materials, tools, and equipment needed and then plan each step involved in creating the digital or non-digital design.

Start creating and remember about the need to write a script for a commercial to advertise the plant and what it processes and produces**.**

Think about how your team might share and present your designs to an audience.

Deliver

This stage is the process by which the dream becomes a reality. It's where you actually implement the designs you have created to complete the solution to the problem in two separate steps:

1. Produce (a design for next evolution of meat processing plant with an identification system that shows all the on-site sustainability and ethical considerations);
2. Write a script for a commercial to advertise the plant and what it processes and produces), and
3. Publish these (presenting the finished designs in your effort to educate others about how red meat might be processed in the next evolution of meat processing plants).

Use the following prompts to write your script.

Write the introduction:

Write the body:

Write the conclusion:

Debrief

Self-Assessment – Things to improve

You need to be able to judge and measure the success of your designs in addressing the original tasks and achieving your goals.

Refer back to the earlier tasks set by AMPC, to see whether you achieved your goals of creating the next evolution of meat processing plant with an identification system that shows all the on-site sustainability and ethical considerations, and a script for a commercial to advertise the plant and what it processes and produces. Did you present the finished designs and educate others about how red meat could be processed in the next evolution of meat processing plant?

Review your work samples and see whether you/your team achieved the goals.

Reflect on the strengths and any weaknesses in the designs.

Brainstorm any things that could have been done differently to get a better result.

Discuss ways you/your team might communicate its success and engage others to try the ideas that worked.

Write an account of the processes undertaken in the project or develop a flowchart identifying various strengths and weaknesses, opportunities and threats of the strategies used in the final designs.

Reflect on the learning

Complete a self-assessment activity.

Using your learning journal to reflect on and answer the following questions:

- How has my/our attitude and behaviour changed as a result of my learning?
- How well did I/we contribute to any pair/team learning activities?
- How can I/we apply what I/we have learned to another topic?

AMPC

AUSTRALIAN MEAT PROCESSOR CORPORATION